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Eastern Europe: Energy Outlook Through 1985

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An Intelligence Assessment

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An Intelligence Assessment

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This paper was prepared by
Office of European Analysis.
Comments and queries are welcome and may be
directed to the Chief, East European Division, EURA,

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Eastern Europe: Energy Outlook Through 1985

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Key Judgments

Information available as of 20 June 1983 was used in this report.

Despite meager indigenous energy resources, Eastern Europe sustained rapid economic growth in the 1970s, in part by importing oil. Soviet willingness to subsidize crude oil prices and large injections of Western credit allowed the region to postpone the worst effects of the world energy crisis until late in the decade. By that time, energy problems had combined with other constraints to slow economic growth to a postwar low.

The East European regimes are now paying the price for energy policies that shifted energy demand to oil away from coal, the region's only significant energy resource. Access to cheap Soviet oil until recently gave these regimes little incentive to conserve energy, to develop alternative energy supplies, or to reform their inefficient economic systems. They have scant ability anymore to finance hard currency energy imports, and they find the USSR less and less willing to supply them with oil—Soviet deliveries showed virtually no increase in 1981 and were actually cut in 1982.

We consider prospects poor for any major improvement in the energy supply situation. Slow growth in the production of domestic energy sources, limited and more expensive Soviet oil deliveries, and the lack of hard currency or credit to buy oil on the world market prescribe only slight growth in total energy supplies. Moreover, markedly improved energy conservation is unlikely in the absence of far-reaching systemic reforms.

Energy, nonetheless, will not be the key constraint to East European economic growth in the years ahead, barring further cuts in Soviet oil deliveries. Even if energy requirements were fully covered by increased imports or substantially higher domestic production, we estimate that other factors—such as inadequate import capacity, slowing rates of investment, declining labor productivity, and continued systemic rigidities—would hold GNP growth to 1.4 percent through 1985, less than half the 1970s average. In the more likely event that net energy imports stagnate while domestic production increases modestly, annual GNP growth would suffer only a slight additional decline to 1.2 percent. Energy scarcities, however, will prolong production bottlenecks and inhibit economic recovery. In the event of further cuts in Soviet oil deliveries, economic growth would slow appreciably, to the point of stagnation and actual GNP declines in some countries.

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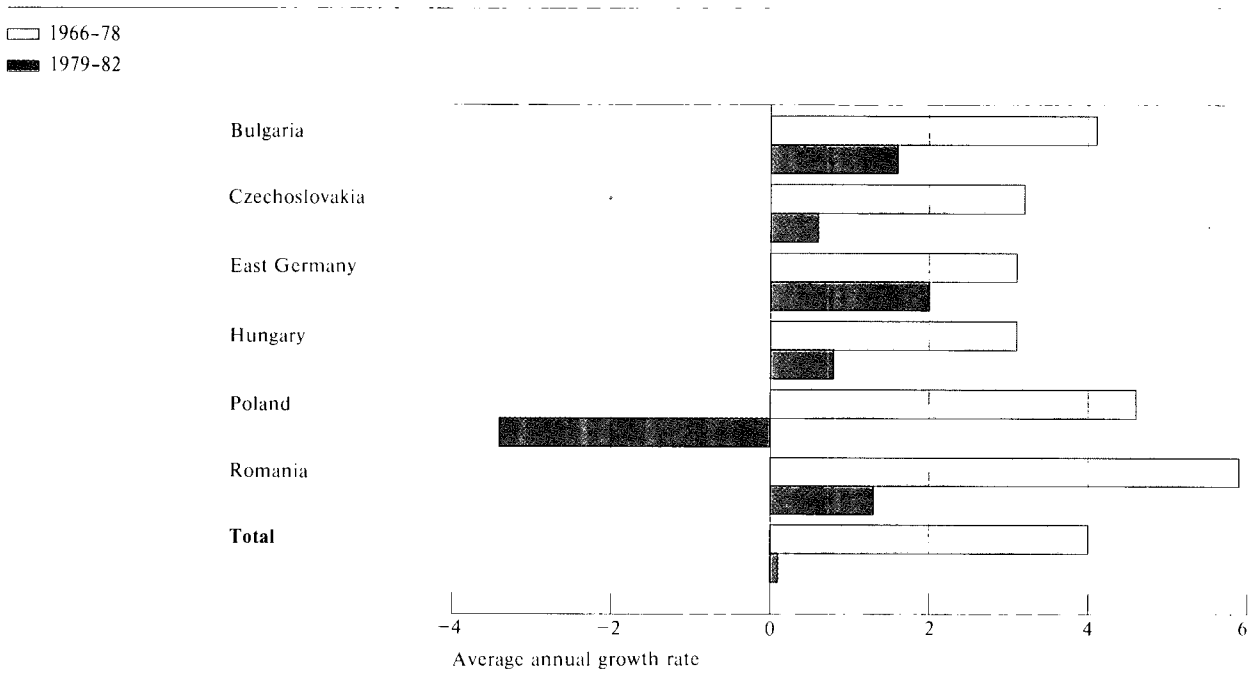
Figure 1
Eastern Europe: GNP Growth



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Eastern Europe: Energy Outlook Through 1985

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Introduction

Eastern Europe had regarded itself for some time as immune from the energy difficulties that plagued the Western economies during most of the 1970s.[1] At first glance, its optimism appeared justified. Access to adequate energy supplies—especially cheap Soviet oil—helped support East European economic growth of around 4 percent per annum during the five years immediately following the 1973 onset of spiraling world oil prices.

As the decade drew to a close, however, it was clear that Eastern Europe was beginning to feel the pinch of more costly energy.[2] In particular, the regimes were finding it necessary:

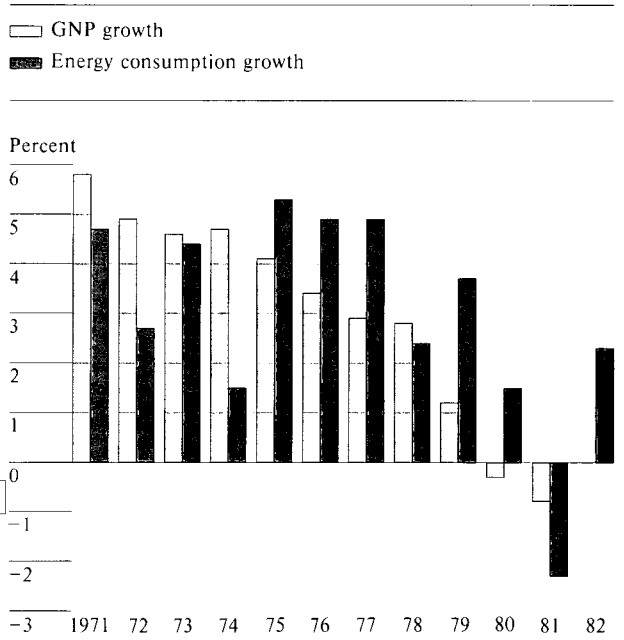
- To reduce their growing dependence on imported oil.
- To boost domestic energy production, especially coal.
- To establish meaningful conservation programs.

The first few years of this decade have demonstrated that energy shortfalls represent just one of many factors leading to a slowdown in East European growth (see figures 1 and 2). Other constraints include:

- Cutbacks in Western lending and serious debt servicing problems
- Adjustment measures aimed at increasing net exports.
- Declining labor productivity.
- Continued economic inefficiency as a result of systemic rigidities.

While the growth showdown has curtailed the rise in demand for energy, all of the regimes continue to put a high priority on dealing with difficulties in the energy sector. Failure to ease energy scarcities will prolong bottlenecks and could inhibit economic recovery once external constraints ease.

Figure 2
Eastern Europe: Energy Consumption and Economic Growth[a]



[a] CIA estimate.

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The Rise of Oil Dependency

One of Eastern Europe's most pressing energy needs over the current decade is to adjust to tighter oil supplies after having made a deliberate effort over the past couple of decades to reduce reliance on domestic

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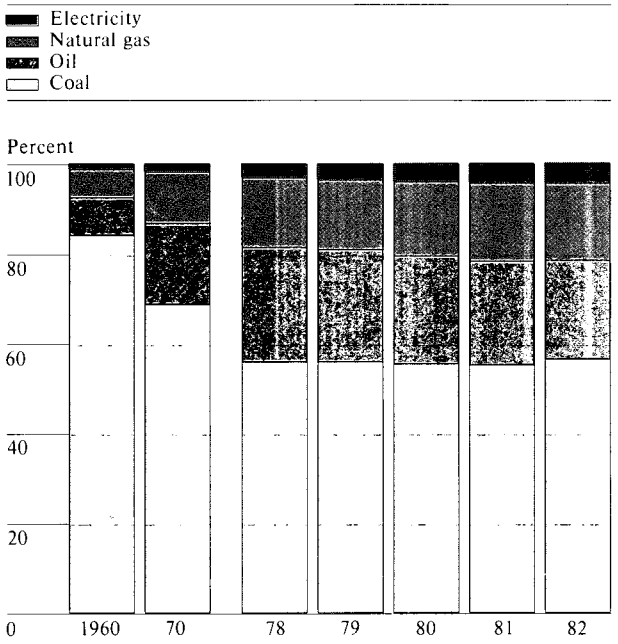
[1] In this assessment Eastern Europe refers to Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Romania.

[2] East European government sources (statistical yearbooks, trade yearbooks, and CEMA yearbooks) provide most of the energy statistics used in this paper. Where necessary, we have utilized UN, Soviet, and other sources to supplement official data.

Figure 3
Eastern Europe: Primary Energy Consumption by Fuel[a]



[a] CIA estimate.

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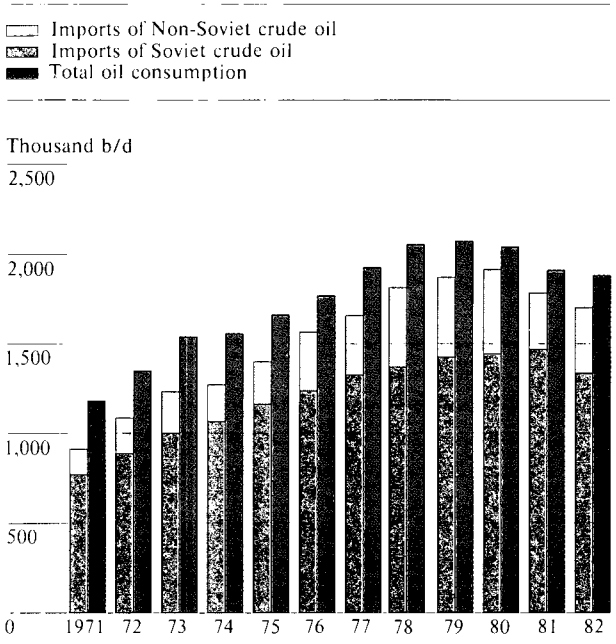
Figure 4
Eastern Europe: Oil Consumption and Crude Oil Imports[a]



[a] CIA estimate.

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coal and step up the consumption of oil. Coal's share in primary energy consumption fell from nearly 85 percent in 1960 to just 55 percent by 1980 (see figure 3). During the same period, oil's share of primary energy consumption rose from a little over 8 percent to nearly 25 percent. While this level of dependence on oil is still well below that of Western Europe, interruptions in supply would have a significant economic impact.

Eastern Europe accomplished this change in its energy mix largely through a dramatic rise in oil imports (see figure 4). Only Romania had significant domestic supplies of oil, and even it began to boost imports sharply over the latter half of the 1970s as domestic production declined because of dwindling reserves. Thus, Eastern Europe's net oil imports of just 41,000 b/d in 1960—about 1 percent of primary energy consumption—climbed to over 1.7 million b/d by 1980 or one-fifth of primary energy consumption.

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The oil story dwarfed another development in the energy picture—the rise in natural gas consumption. With the completion of the Orenburg pipeline, Soviet gas exports to the area nearly doubled between 1978 and 1980, rising to almost 30 billion cubic meters. Even so, by 1980 these imports accounted for just one-third of natural gas consumption and less than 6 percent of total primary energy consumption.

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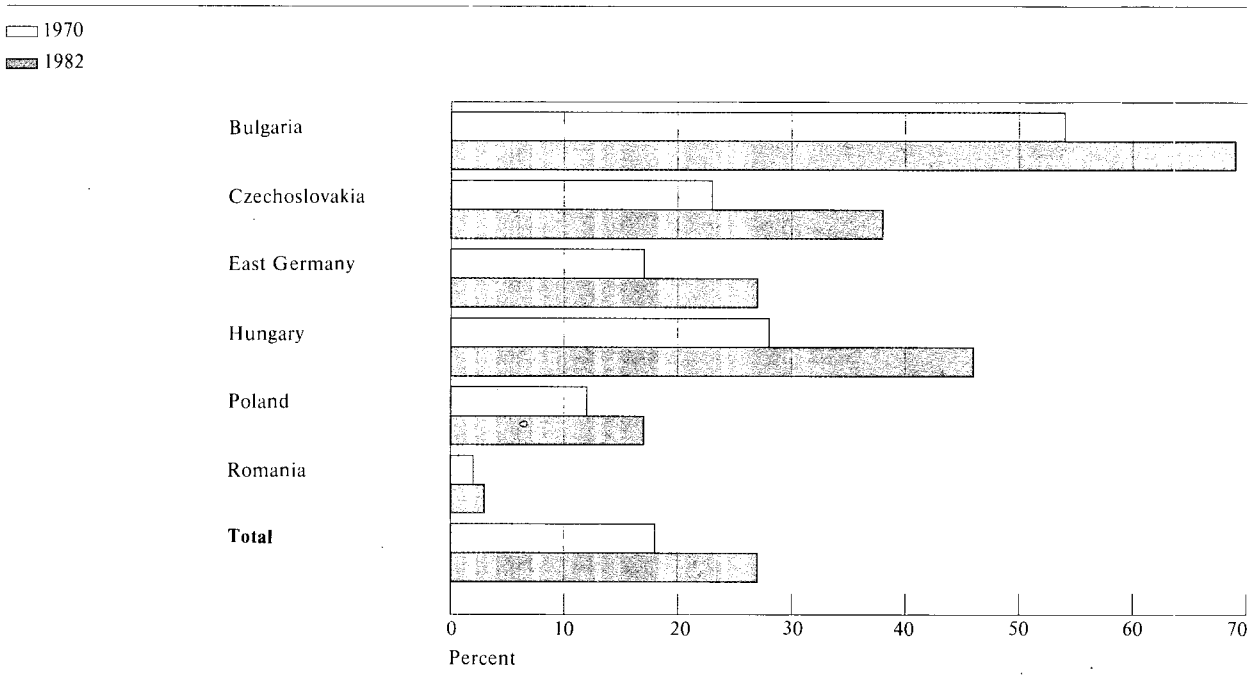
Figure 5
Eastern Europe: Energy Imports from the USSR as a Share of Total Energy Consumption



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The Soviet Factor

The Soviet Union was chiefly responsible for the surge in oil imports.[3] By 1980 net imports of Soviet oil were running at a rate of almost 1.6 million b/d, accounting for well over 90 percent of the region's total net imports of oil and about two-thirds of total energy imported from the Soviet Union. This increase in oil imports contributed to the region's growing energy dependency on the USSR (see figure 5).

Not only did Soviet oil deliveries rise substantially, but the terms offered Eastern Europe were quite favorable. The Soviets did not raise oil prices to Eastern Europe during the first OPEC price explosion in 1973-74 and have based prices since 1975 on average world prices for the preceding five years. This formula essentially shielded most of Eastern Europe from oil price shocks while providing a continuing subsidy throughout the period of rising world oil prices.

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Eastern Europe's access to adequate amounts of cheap Soviet oil came to an abrupt halt in the early 1980s. The region entered the current 1981-85 Five-Year Plan period expecting annual deliveries of oil and coal from the Soviet Union generally to be held constant at the 1980 level. Increases in alternative energy deliveries from the USSR would depend largely on the completion of large-scale energy projects.

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Eastern Europe's energy picture worsened in the fall of 1981 when Moscow informed most of the countries that it would reduce concessional oil deliveries beginning in 1982 and probably continuing through at least 1985. Annual deliveries to Czechoslovakia, East Germany, and possibly Bulgaria were cut by 10 percent or by approximately 40,000 b/d each to Prague and Berlin and 30,000 b/d to Sofia. The cut for Hungary was probably less—perhaps 10,000 b/d. The USSR maintained deliveries for the time being to Poland because of its precarious economic and political situation. Romania also was not included in this change of policy since it has never enjoyed the favorable terms offered to the rest of Eastern Europe. Bucharest has always paid world market prices in hard currency or hard goods for the small quantities of Soviet oil it has purchased.

We are not certain of the rationale for the cuts, which came soon after Moscow had promised to maintain constant deliveries, but we believe the Soviets' need for hard currency was a major factor.[4] Moscow may have believed that the East Europeans could absorb the oil reductions without jolting their domestic economies. In fact, the countries singled out by the USSR had substantially boosted oil product exports to the West in 1980 compared with 1979:

- East Germany increased its oil product exports by a third to over 60,000 b/d.
- Czechoslovakia doubled exports to 26,000 b/d, while Hungarian exports were up by 40 percent to nearly 17,000 b/d.
- Bulgaria, whose oil product exports were minimal during most of the 1970s, exported some 30,000 b/d in 1980.

Oil product exports continued to be a significant source of hard currency for the region in 1981, totaling nearly $4 billion, about 12 percent of hard currency exports; Romania accounted for about one-half of these sales.

Few OPEC Purchases

Current foreign exchange constraints, will limit Eastern Europe's ability to take advantage of the recent drop in world oil prices to offset the cutbacks in Soviet oil deliveries. Indeed, OPEC oil has never been much of a factor in Eastern Europe's switch to oil except in the case of Romania. Excluding Romania, non-Soviet crude oil imports by Eastern Europe peaked at only 168,000 b/d in 1980, up just 9 percent from 1972. This oil accounted for less than 10 percent of total oil imports and just 2 percent of primary energy consumption.

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Romania, on the other hand, sharply boosted oil imports from the Middle East and North Africa in the latter half of the 1970s. With domestic production peaking in 1976 at 294,000 b/d, Bucharest needed oil to feed its growing refining industry. Crude oil imports jumped to 319,000 b/d by 1980, triple the 1975 level, and provided nearly 60 percent of Bucharest's oil needs (consumption plus exports). About two-thirds of these imports came from just three countries: Iran, Iraq, and Libya. During this period, Romania bought small amounts of Soviet oil in an effort to diversify its suppliers, but received no financial breaks.

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Some of the East European countries are attempting to take advantage of the current soft world market for oil, both to improve domestic supplies and hard currency earnings from product sales. Hungary, for example, concluded an arrangement with Iran in late 1982—possibly a barter deal arranged with Soviet help according to the US Embassy—that increased crude oil imports by 20,000 b/d and thus helped to keep it active in the export market as well as to boost reserves. Before the agreement, crude oil imports had dropped by over 40,000 b/d since 1979. Low oil prices also helped East Germany and Bulgaria maintain oil imports at a higher level than if oil prices had not declined.

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The other three countries have been unable to make much headway out of current conditions. Both Poland and Czechoslovakia apparently are reducing annual OPEC purchases to just a couple of tankers at the moment. Romania, which has seen its crude oil imports drop 35 percent the past two years because of the unprofitability of its refineries, remains undecided about final plans for imports this year but is likely to cut imports further.

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Whatever benefits Eastern Europe manages to derive from the current drop in prices may be eroded by the negative impact of declining crude oil prices on the Soviet Union. In an effort to maintain hard currency earnings from oil exports, Moscow will be tempted to make further reductions in concessionary deliveries to Eastern Europe to free more oil to the West. 25X1

Difficulties With Domestic Energy Production and Conservation

Eastern Europe has not been able to increase its own energy production enough to compensate for the tighter import picture it now faces. Intense efforts to boost production are being hindered by reduced levels of investment, cuts in imports of Western technology and equipment, and declining labor productivity. Current production of all energy sources is nearly 6.4 million b/d (oil equivalent) or just 1.8 percent higher than 1978 (see figure 6). 25X1

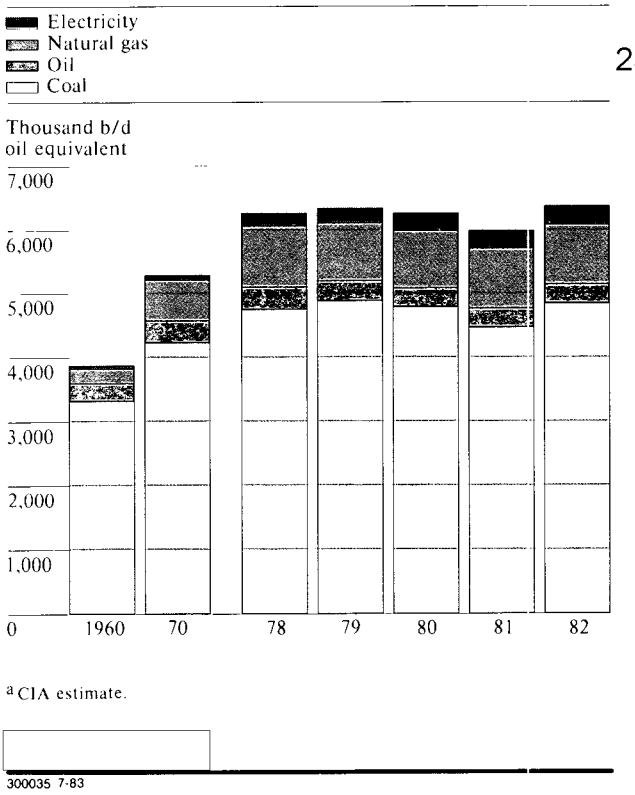
Coal

The region was hurt by the nearly 20-percent drop in Polish hard coal production between 1979 and 1981, which led to a sharp drop in Polish coal exports to the rest of Eastern Europe. Although Polish hard coal accounted for only a small fraction of the other states' total coal consumption—about 6 percent in 1979, the last year of normal deliveries—this high-quality coal was not easily replaced in certain industrial sectors, particularly ferrous metals and chemicals. 25X1

The upswing in Polish coal output since the beginning of martial law has helped somewhat. Production in 1982 rose by 16 percent, compared to 1981, and total exports nearly doubled. As a result, deliveries to Eastern Europe probably reached nearly 90 percent of their pre-Solidarity level. 25X1

Elsewhere in Eastern Europe, coal production has grown only 1.6 percent per year during the past three years, despite efforts to boost output substantially. Romanian coal output grew by about 5 percent in 1981 and only 2.4 percent in 1982—down sharply from the 11-percent rate recorded in 1979 and well below recent targets. Hungarian coal production continues to stagnate, and, while Czechoslovak coal production grew marginally in 1982, it is still at the same level as in 1979. Bulgarian coal production fell slightly in 1981 but rebounded by 8.5 percent in 1982. 25X1

Figure 6
Eastern Europe: Primary Production of Energy by Type of Fuel[a]



[a] CIA estimate.

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Lignite production in East Germany grew by well over 3 percent in 1981—the best performance in several years—and continued at this pace through 1982. 25X1

Despite the enormous efforts being made to increase coal extraction, the East Europeans publicly admit that the following obstacles continue to hinder output and cannot be overcome easily: 25X1

- The excessive and increasing ratio of overburden [5] to coal and the high water content found in lignite deposits.
- The growing and often acute shortages of machinery and spare parts, especially for equipment purchased in the West.

[5] The dirt, rock, trees, and so forth that cover strippable coal seams.

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- The declining calorific content of the coal mined as hard coal deposits dwindle in all of the countries but Poland, leaving the region dependent on low-quality brown coal and lignite.
- Increasing environmental concerns that can no longer be ignored.

Oil and Gas

The region as a whole has meager reserves of oil and gas, and domestic production has increased an average of barely 1 percent per year since 1979. While Romania actually boosted oil production marginally in 1981 and in 1982, halting a four-year slide, output still remains some 20,000 b/d below the current plan and 60,000 b/d below peak production in 1976 of 294,000 b/d. Romania also increased natural gas output slightly in those years. Hungary hiked gas production about 5 percent last year, reversing a three-year decline. The other East European countries are struggling to prevent further drops in their modest production of these fuels.

Nuclear Power

Nuclear power production has been the one bright spot in the energy picture over the past few years, with output doubling since 1978. Three countries—Bulgaria, Czechoslovakia, and East Germany—produce an appreciable share of their electricity from Soviet-designed nuclear power plants. Sofia has been aided by additional output from two 440 MW reactors that came on line in mid-1981 and now derives nearly a fourth of its electricity from nuclear power. Prague's two 440 MW reactors, which began operation in 1979 and 1980, provide nearly 8 percent of that country's total electricity production. The East Germans are receiving about 12 percent of their electricity from the four 440 MW reactors at Lublin. As for Hungary, it connected the first reactor at Paks to the electric grid only late last year.

The increase in the number of nuclear power plants coming on line has not obscured the fact that optimistic targets are not being met. Although electricity production has grown because of new nuclear plants, nuclear power still provides less than 3 percent of primary energy production. The nuclear program has lagged badly from the start, and some problems appear to be worsening. Czechoslovakia, a major supplier of reactor components, has publicly admitted that supplying the rest of Eastern Europe has been a burden to its economy. Moreover, a Czechoslovak official recently told the US Embassy that the industry suffers from a shortage of skilled workers at the nuclear power plant sites. 25X1

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Inefficient Energy Use

Despite growing problems with its energy supplies, Eastern Europe has been slow to make adjustments on the demand side. Throughout the latter half of the 1970s, the rise in energy consumption continued to exceed GNP growth. Relative to the developed West, Eastern Europe is notoriously inefficient in its use of energy. Per capita consumption of energy for the region as a whole exceeds that of Western Europe, for example, even though per capita GNP and living standards are noticeably lower. 25X1

The region was able to postpone serious energy conservation efforts because of increased imports of Soviet oil at concessionary prices. The initial conservation steps undertaken in the mid-1970s were weak, focusing on consumer education and introducing contests among firms to save energy in the name of "socialist competition." These programs were later supplemented with measures such as daylight savings time, reduced public lighting, alternate weekend driving, and decreeing maximum room temperatures 25X1

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As the need for more serious conservation initiatives arose, the regimes overcame concern about adverse consumer reactions and sharply increased energy prices in 1979:

- Bulgaria upped prices for gasoline by over 80 percent and for other fuels by 50 to 100 percent.
- Czechoslovakia and Hungary boosted overall energy prices by 50 percent and 34 percent, respectively.
- Romania hiked retail and producer prices of energy by 50 to 100 percent. 25X1
- Poland increased the price of gasoline by 23 percent and fuel oil by 20 percent.

Periodic consumer energy price adjustments—some quite substantial—are now commonplace throughout Eastern Europe and recently have spread to include even industrial energy prices. Only East Germany has

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remained reluctant to boost consumer energy prices, choosing instead to cut allocations. East Berlin strictly enforces stringent consumption norms through frequent spot checks and heavy financial penalties.

For the most part, these East European attempts at conservation have achieved only limited results. The energy-GNP ratio has not been markedly affected by conservation programs, and recent energy savings appear more the result of economic slowdown. Only East Germany appears to have made some headway in this area, with GNP growth of 2.3 percent in 1980-81 outpacing the increase in energy consumption. Elsewhere in Eastern Europe, increases in output continue to require disproportionately large increases in energy.

Several factors contribute to this continuing inefficient use of energy, including:

- An economic reward system based on production plan fulfillment rather than efficiency (profitability).
- Outdated industrial plant and equipment installed in an era of cheap energy.
- Continued heavy reliance on poor quality coal as a source of industrial energy.
- Conservation programs focusing on households and other nonindustrial users, who account for only about one-fifth of total energy consumption.

Energy Plans Through 1985

Eastern Europe almost certainly will not overcome its energy difficulties in the near term. We estimate that overall energy supplies (production plus net imports) will grow by a little over 1 percent a year through 1985 compared to nearly 4 percent in the 1970s. Domestic production likely will account for all of the gain but will fall well below ambitious targets. Energy imports are not expected to grow because whatever additional natural gas and electricity the Soviet Union provides is apt to be offset by falling oil imports. Soviet oil deliveries are expected to remain flat at best, and foreign exchange constraints will continue to limit purchases of OPEC oil unless prices fall significantly. The bleak supply picture is forcing Eastern Europe to tackle problems on the demand side, and nearly all of the regimes are now focusing on energy conservation. But energy savings more likely will reflect continued stagnation of the economies than improved efficiency in use.

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Production Prospects

The 1981-85 East European economic plans contain rather ambitious production goals for domestic fuels despite poor performance over the past decade. Plans vary widely within the region, however, ranging from Romania's goal of energy self-sufficiency within the next few years to Hungary's and Czechoslovakia's modest 2 percent a year increase in energy output. For the region as a whole, energy production is targeted to grow by about 5 percent a year, well above the 1.7 percent average annual rate recorded during the 1970s. The plans also show that the East European regimes are counting on production to outstrip consumption, thus raising the share of domestic energy production in total primary energy consumption from 72 percent in 1981 to 77 percent by 1985.

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The area's ambitious production plans rest almost entirely on increasing coal production and nuclear power capacity. Only Romania seeks to boost oil and gas production significantly. Official plans project that coal production for the region will grow by about 5 percent a year through 1985, compared with the barely positive growth achieved during 1976-80. Electricity production from nuclear power sources is planned to increase by about 15 percent a year, with plant capacity growing from the current level of 4.8 billion kW to at least 11 billion kW by the end of 1985.

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Although energy production should pick up somewhat in Eastern Europe, the regimes' targets are unrealistic. We estimate that coal output will grow by only 1 to 2 percent annually, at best, given the difficult problems confronting the extractive industry. The production of natural gas and oil will stagnate. Furthermore, we believe that the nuclear power program will fall far short of plan objectives. Given the delays experienced so far, we estimate the maximum nuclear

Table 1 *Megawatts*
Eastern Europe: Installed Nuclear Electricity Generating Capacity

	1982	1985 (Planned)	1985 (CIA Estimate)
Total	**4,840**	**11,410-11,850**	**7,990**
Bulgaria	1,760	2,760	1,760
Czechoslovakia	880	3,520	2,640
East Germany	1,760	3,150	2,710
Hungary	440	1,320-1,760	880
Poland	0	0	0
Romania	0	660	0

Source: CIA estimates.

power capacity likely to be reached by 1985 at 8 billion kWh, 30 percent short of the objective (table 1).[6]

Future Soviet Deliveries

Official five-year plans indicate that Eastern Europe still hopes to receive some additional energy from the Soviet Union over the next few years despite the cutbacks in oil deliveries in 1982. While the plans imply that Soviet oil and coal deliveries will remain constant, East European officials mention increased imports of electricity and gas of as much as 250,000 b/d oil equivalent. Yet even if deliveries increased according to East European plans, total Soviet energy deliveries would still rise by well under 10 percent for the whole period 1981-85, compared to the nearly 40-percent increase during 1976-80. Exactly how much more Soviet energy might be delivered and how soon—even for the small increment mentioned—remains highly tentative and dependent on the completion of several major energy projects. We doubt that Eastern Europe will receive more than half the amount of new gas and electricity it is talking about. Moreover, we would not be surprised if the Soviets make further oil cuts to help ease their own problems with domestic oil supply and hard currency shortages.

The Soviets' ability to increase deliveries of electricity hinges, for the most part, on two major electrical projects currently under way in the Soviet Union. Both have hit snags. Hungary, Poland, and Czechoslovakia are helping to construct the Khmelnitski atomic power station and a transmission line. The USSR plans to begin deliveries to them in 1984, and by 1985 the three countries hope to receive a total of 7 billion kWh annually. Construction delays at Khmelnitski, however, are likely to put back the startup date to mid-1985 at the earliest. Similarly, Bulgaria and Romania are helping to build the Konstantinovka atomic power complex in the southern Ukraine. An agreement among the Soviet Union, Bulgaria, and Romania for a transmission line from the Konstantinovka plant was reached only in August 1982, which means the plant is not likely to supply electricity to Eastern Europe before 1985.

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Soviet deliveries of natural gas could play an increasingly important role in Eastern Europe's energy picture. In part, future gas deliveries depend on the completion of new pipelines, including the new Siberia–to–Western Europe pipeline. Czechoslovakia's position appears good, with the Czechoslavak press recently announcing that the country would receive 2 billion cubic meters annually from the new pipeline. The Poles have recently announced in the press that they will receive an additional 2 billion meters of gas as payment for help on pipeline work within the Soviet Union. While East Germans also hope for some additional gas as compensation for their help in pipeline construction work, early in 1982 an East German official told the US Embassy that additional gas deliveries were not assured.

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According to press reports, Bulgaria expects to receive up to 10 billion cubic meters annually by 1985—a hefty 5.5-billion-cubic-meter hike over current deliveries. Some of this gas appears tied to the old Orenburg project. Bulgaria has yet to receive its full allotment for work done on this project, apparently because it has not yet completed work on its internal pipeline network.

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The Bulgarian situation highlights an important problem regarding Soviet gas—the capability of Eastern Europe to use additional gas imports. Current official plans mention additional deliveries in the range of 13 billion cubic meters to Eastern Europe by 1985, either through the new pipeline or unused capacity in the Orenburg pipeline. But natural gas is not a good substitute for oil and cannot be used at all in some activities such as transportation. Czechoslovakia, for example, has for some time pressed the Soviets for oil instead of gas and the US Embassy in Prague recently reported that Czechoslovakia may finally receive some additional oil this year in lieu of natural gas. Sofia's ambitious plan for more gas depends not only on completing internal pipelines but also on doubling the number of plants that can use this fuel.

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Prospects for Hard Currency Imports

Despite poor prospects for domestic energy sources and Soviet deliveries (especially of oil), we do not believe that Eastern Europe will purchase large amounts of oil on world markets even at reduced prices. The outlook for the region's hard currency import capacity is extremely bleak through at least mid-decade because of declining export growth, onerous debt service obligations for some countries, and poor borrowing prospects. Recession in the West has been only one factor contributing to the slowdown in the annual growth rate of East European exports to developed countries to an average of 6.2 percent in the period from 1979 to 1982, versus 14.8 percent between 1970 and 1978. Moreover, continuing deterioration in the terms of trade with the West has required the East Europeans to export a greater volume of goods merely to sustain a constant real level of imports.

Deteriorating terms of trade with the USSR also are expected to continue as the cost of Soviet raw materials outpaces the rise in prices for manufactured goods produced by the East Europeans. For example, the CEMA price for crude oil rose to over 90 percent of the world market prices this year and will surpass the world market price next year if no adjustment is made to the current pricing formula. (See figure 7).

In the last decade, most East European economies were able to live well beyond their means by borrowing to finance imports in excess of exports. The accumulation of hard currency debt, however, has left most regimes saddled with onerous debt service obligations, reducing their capacity to import. Their financial problems are forcing them to implement severe austerity measures—principally focused on reducing imports—or to accept debt rescheduling as in Romania or Poland. Despite some success with adjustment measures in Eastern Europe, Western bankers remain cool about lending to the region, including to those countries—Bulgaria and Czechoslovakia—which have their international finances in relatively good order. Without a revival in lending, the prospects are not good for a boost in the region's hard currency import capacity.

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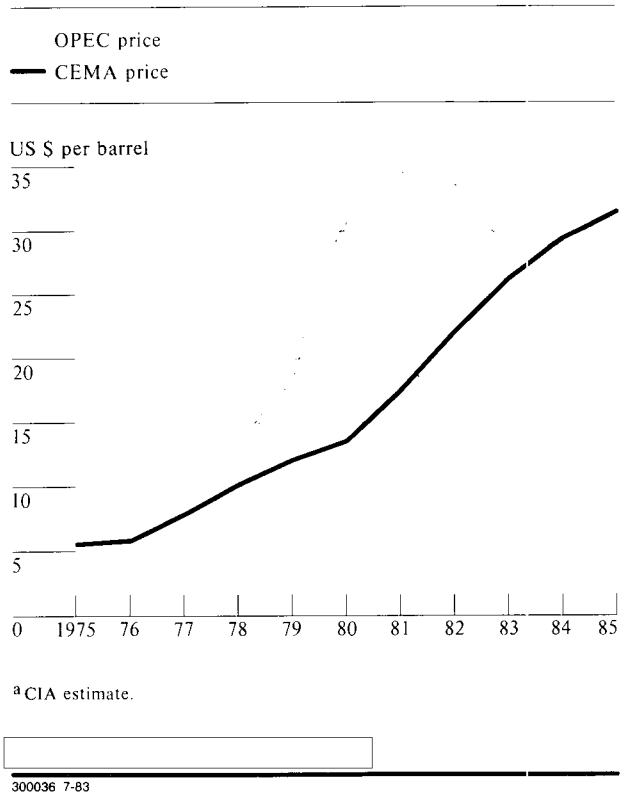
Figure 7
Eastern Europe: Crude Oil Prices[a]



[a] CIA estimate.

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Renewed Conservation Efforts

Given the bleak prospects for fuel supplies, the East European regimes are planning to put more emphasis on energy savings. The regimes hope to curtail energy requirements through a combination of:

- Stabilization measures that will dampen demand.
- Some restructuring of the economies toward the less energy intensive sectors.
- More stringent conservation measures designed to improve energy efficiency (that is, reduced energy-output ratios).

Most East European countries were forced to accept lower growth rates in the late 1970s and early 1980s—which, in turn, slowed growth in the demand for energy—in order to deal with mounting external financial constraints. Hungary has been implementing austerity measures since at least 1979, and Czechoslovak officials recently have acknowledged publicly that little or no growth is expected in the near term. While Romania and Bulgaria have lowered targets somewhat compared to past plans, publicly announced goals remain ambitious. At the same time, East German officials publicly voice confidence in the economy's buoyancy despite slower growth last year and difficult financial problems on the horizon.

East European officials have discussed restructuring their economies to conserve energy, but they generally recognize that this is not a near-term solution. Constraints on imports and investment will preclude retooling many plants. Moreover, the worsening unemployment often accompanying structural change would be problematic, especially with officials already concerned over growing consumer frustration. Finally, any moves that would significantly alter production capabilities would have to be considered in the larger context of commitments to other CEMA countries and, therefore, could not be taken unilaterally.

Most of the regimes, therefore, are apt to rely even more heavily on conservation programs. We expect that frequent price boosts to both households and industry will continue in all countries except East Germany. Tighter controls over the allocation of energy, as in East Germany, also are planned. The regimes probably will also pursue conservation measures that have received little attention in the past, including:

- Improved insulation, especially in apartments or along heat-carrying pipelines.
- Greater use of secondary energy sources, including the heat byproduct of electricity production;.
- Better monitoring of consumption through the installation of metering devices.
- Some upgrading of the capital stock, especially the replacement of inefficient boilers and furnaces. 25X1

We judge that the East European conservation effort will have only a limited impact on fuel saving over the next few years. Success would require extensive substitution of new capital for energy, an effort that will be seriously impeded by the slowdown of investment throughout the region. In 1981 new investment averaged little more than 6 percent of the total capital stock in the region, and about one-third to one-half of this was needed merely to cover depreciation or replacement of old capital assets. For the next few years, only Bulgaria and Romania project annual investment growth in excess of 2.5 percent a year. For the rest of the region, investment is expected to stagnate or fall. 25X1 25X1

Another major impediment to boosting energy efficiency is the increasing share of coal in the region's energy balance—especially the low-quality coal that predominates in the region. Czechoslovakia publishes figures that show that the quality of their coal (measured in BTU/ton) is dropping by about 1 percent a year. Even Polish hard coal is suffering from declining heat content, falling by about 0.6 percent a year, according to official Polish data. The regimes, nevertheless, continue to base their plans on boosting coal production. The East German plan, for example, calls for a greater use of lignite to offset shortfalls in oil and hard coal imports 25X1 25X1

Finally, we doubt that much progress toward energy efficiency can be made without market-type economic reforms. Current price hikes will help somewhat, but energy remains underpriced in most of the region. For example, producer prices for natural gas in Romania—the country's largest source of primary energy—remain at about half the world market price, despite recent sharp increases. Moreover, one Hungarian academician notes, boosting energy prices without carefully considering their relationship to one another 25X1

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and to prices of the nonenergy factors of production will introduce still further distortions in the economy. Most important, in our opinion, a piecemeal approach to reforming these economies can have only limited success in combating waste; energy will continue to be overused as long as production volume rather than efficiency remains the key indicator of success for plant managers.

Impact on Economic Growth

Eastern Europe enjoyed strong economic growth from the mid-1960s until the second half of the 1970s as a result of adequate energy and labor supplies, buoyant investment, and rapid growth of imports from the West. From 1966 to 1978, East European GNP grew about 4 percent per year, with annual average rates of growth of 3 percent for Czechoslovakia and East Germany at the lower end of the spectrum, compared with rates of growth in excess of 5 percent for both Poland and Romania. Energy supplies rose on average by 4 percent annually over this period, and healthy gains in labor productivity—3 percent per year from 1966 to 1978—resulted from accelerating inputs of capital and Western goods purchased for hard currency. The level of investment increased by over 8 percent per year and imports from the West (in current prices) by 20 percent per year.

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By the late 1970s, energy shortages combined with other more serious problems to slow the momentum of the East European economies. From 1979 to 1982, annual GNP growth for the region excluding Poland averaged only 1.3 percent. Only East Germany maintained respectable rates of GNP growth (about 2 percent); growth in Czechoslovakia and Hungary fell from over 3 percent in the 12 years to 1978 to less than 1 percent from 1979 to 1982.

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Prospects for the rest of the 1980s are bleak as a result of the numerous problems and constraints that are now hitting the East European economies. We expect that the rapid capital accumulation that contributed to healthy GNP growth in the late 1960s and 1970s will be far less robust in the 1980s. To deal with external financial problems, adjustment programs will lead to sharply curtailed investment and to continuing attempts to squeeze trade surpluses from strapped domestic economies.

East European planners share our pessimistic assessment of the growth stimulus that would result from the *extensive* employment of the "factors of production." Published plans indicate that labor, capital, energy, and even materials are expected to increase only slightly in the 1980s. Thus, whatever growth is realized must come from the *intensive* utilization of these inputs, that is, higher productivity. Since 1979, however, labor productivity growth has declined steadily except in East Germany, where it continued essentially unabated until 1982.

In order to assess the growth prospects of Eastern Europe through the mid-1980s on the basis of several scenarios about energy supplies, we use an analytical model that quantifies the contributions of labor, capital, energy, and other measurable factors to GNP growth.[6] We first use production functions, estimated from East European economic performance since the late 1960s, to measure the contribution of labor and capital to GNP growth. While the level of GNP is fairly predictable once labor and capital have been estimated, variations in annual GNP also depend on other factors; in addition to energy supplies, technological change, living standards, systemic problems, and weather all affect productivity and thus economic growth.

We judge that the decline in productivity since the late 1970s is attributable to the combined influence of these factors. None is expected to provide a healthy stimulus to growth over the next several years. Our estimates in the scenarios below are based on productivity trends for the period 1978 to 1982, which may be too optimistic because productivity could decline further as a result of stagnant imports, declining living standards, and an aging capital stock. In every country, productivity has been noticeably poorer in one or more recent years than our projection. (See table 2 for projections of the most important economic indicators used in our estimates.)

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[6] See inset, page 12, for a brief explanation of the analytical framework used to make these estimates. The quantitative framework used in this paper does not explicitly identify the sensitivity of GNP to trade. To the extent trade has influenced the trend in productivity, its impact is implicitly included in our projection of combined factor productivity trends.

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How Energy Supplies Affect Economic Growth: The Methodology

Energy shortages affect economic growth by diminishing the effective use of the means of production. In particular, energy shortfalls limit the operation of transportation equipment and machinery. In order to estimate the impact of energy shortfalls on economic growth prospects, we proceed through five steps.

Forecast Energy Required To Operate the Capital Stock

Expected additions to the capital stock can be estimated by extrapolating historical rates of capital accumulation as a function of investment. Because annual capital retirements include only about 2 percent of the existing stock, levels of gross investment exceeding 2 percent of capital stock provide for net capital expansion. Thus, despite constant or even declining levels of investment, we expect capital stock to continue to expand, albeit at a much slower pace than experienced in the 1970s. For the region as a whole, we expect the capital stock to grow at nearly 4 percent per year through 1985.

Energy efficiency (energy per unit of capital) has improved at an average rate of 1 to 2 percent per year since the mid-1960s. Despite declining efficiency prospects because of investment slowdowns and diminishing import capacity, we optimistically project that the annual gain in efficiency will continue to average about 1.9 percent per year through 1985. These trends in energy efficiency—combined with projected capital stock—yield our estimate of the growth in energy demand (that is, the energy required to operate the capital stock). Our estimate shows that energy requirements will continue to grow at an average rate of 1.9 percent per year through 1985—a marked slowdown relative to annual rates near 4 percent in the 1970s.

Estimate Energy Supply Prospects

We combine our projections of indigenous energy production capabilities with our estimates of likely net imports from within CEMA (principally the Soviets) and from the hard currency market to arrive at energy supply forecasts. We expect that energy supplies for the region will increase about 1.3 percent per year through 1985.

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Calculate a Measure of Energy Shortage

The difference between our projection of energy requirements and energy supplies allows us to determine the existence and size of energy shortages. Our estimates of energy balances for Eastern Europe through 1985 indicate that shortages will grow. In several countries expected energy supplies will fall behind demand by as much as 10 percent by 1985.[a]

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Assess the Effect of Energy Shortages on Capital Utilization

We assume that the ratio of energy supply to demand reflects any sacrifice in capital utilization due to energy shortages. If, for example, only 90 percent of nominal energy demand can be met, 10 percent of potential capital services are lost. Effective capital stock is thus defined to be total capital multiplied by the energy supply-to-demand ratio. If capital were the sole productive asset, GNP growth would be directly proportional to the change in effective capital. However, since capital is only one factor of production, potential GNP is diminished by something less than the energy supply-to-demand ratio. Labor, the other principal factor of production, is less directly affected by energy availability.

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Evaluate the Impact of Reduced Capital Services on Growth

Using historical data, we estimate the shares of GNP growth attributable to capital and to labor, and we use these relationships to forecast GNP. The relevant measure of capital services in this calculation is the effective capital stock. Because only about a third of GNP is contributed by capital, a reduction in the energy supply-to-demand ratio by 3 percent, for example, would reduce potential GNP by about 1 percent.

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[a] *Energy shortages are necessarily an* ex ante *phenomenon. By the end of 1985, for example, adjustments (such as lower GNP) will have been realized, and* ex post *supply and demand will, of course, be the same.*

Table 2
Eastern Europe: Key Projections, 1983-85

Average annual rates

	Bulgaria	Czechoslovakia	East Germany	Hungary	Poland	Romania
Employment	0.7	0.8	0.9	0.6	0.8	2.0
Investment	0	0	0	0	0	0
Capital stock	6.9	3.8	3.4	3.7	2.6	6.1
Energy efficiency of capital [a]	3.1	1.9	1.9	1.7	1.3	3.0
Energy required for full capital utilization	3.7	1.8	1.4	2.0	1.2	2.9
Industrial productivity [b]	−1.0	−1.0	0	0	−3.0	−2.0

[a] Projected annual improvement in energy per unit of capital—equal to average annual trend from 1965 to 1981.
[b] Projected annual change in combined factor productivity in industry relative to the average annual performance from 1965 to 1981.

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Scenario 1: No Energy Shortage

In this scenario, we have projected feasible economic growth rates in the absence of a shortage of fuels in order to assess the slowdown in growth due to constraints other than energy. With sufficient energy supplies, we estimate that growth in the region as a whole would average only 1.4 percent per year through 1985, a marked slowdown relative to performance from 1966 to 1978 but a slight improvement over the recent past (see figure 8). Adequate energy supplies thus would enable regional growth to recover moderately from the virtual stagnation since 1978. The medium-term growth potential of Czechoslovakia, Hungary, and Romania in particular would be better in this scenario compared with the last four years. But, to sustain even this modest rate of growth of regional GNP would require additional energy imports of 500,000 million b/d by 1985. Assuming no increase in Soviet oil deliveries, purchases of this magnitude on the world market would cost $5 billion per year at current prices. We estimate that such costly imports would be very unlikely in light of continued balance-of-payments problems and the desperate need for nonenergy imports.

Scenario 2: Soviet Deliveries at 1982 Level Through 1985

The far more likely scenario, in our opinion, assumes no increase in energy purchases on the world market, includes the assumption that concessionary Soviet deliveries remain at the 1982 level through 1985, and assumes a 10-percent drop in energy exports. An expected moderate increase in domestic production would allow energy supplies to grow, but by only 1.3 percent per annum. Our projection of capital growth and annual efficiency gains at the rates achieved since 1966 indicate that nominal energy demand could increase by about 1.9 percent per year through 1985 for the region as a whole despite intense efforts to conserve (see table 3). The resulting widening disparity between nominal energy requirements and available fuels would contribute to depressed regional economic growth through at least mid-decade. We estimate that, as a result of energy shortfalls, GNP growth would average less than 1.2 percent annually through 1985, down only marginally compared to growth with no energy constraints.

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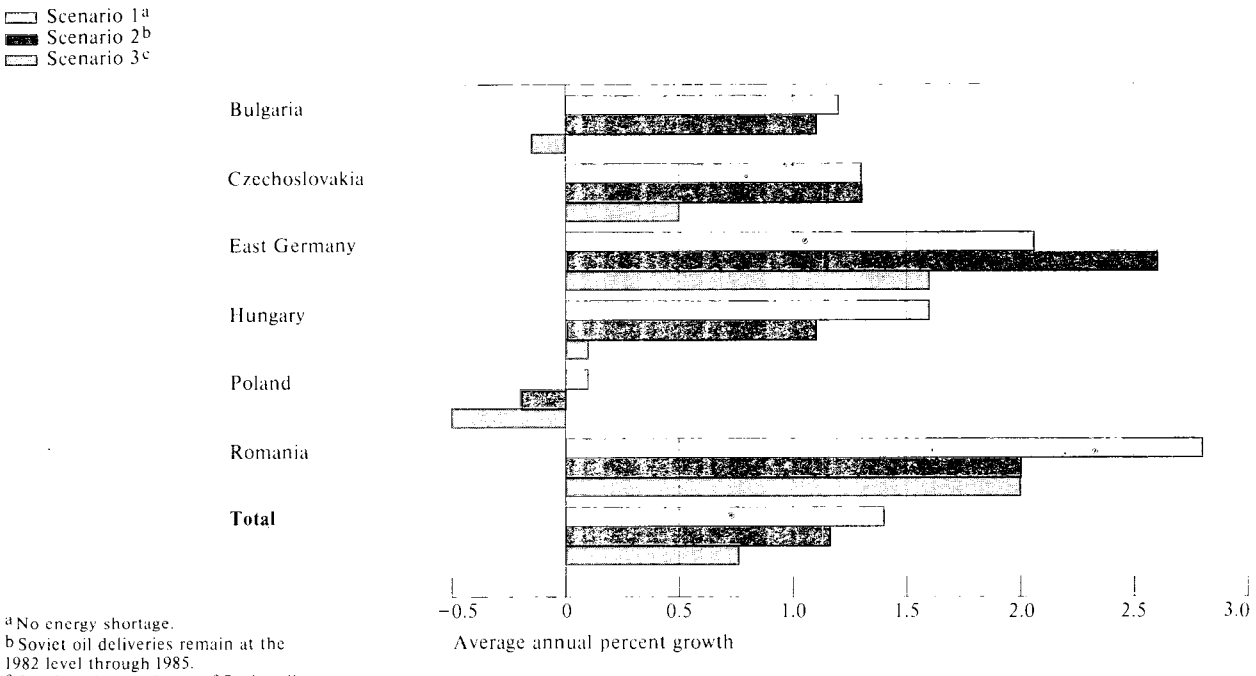
Figure 8
Eastern Europe: GNP Growth, 1983-85



[a] No energy shortage.
[b] Soviet oil deliveries remain at the 1982 level through 1985.
[c] Continued annual cuts of Soviet oil deliveries equal to 10% of 1981 levels.

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The following summarizes differences in the outlook for individual countries in the region:

- East Germany's ability to improve energy efficiency, if sustained, would prevent effective energy shortages despite only modest growth of supplies. GNP is likely to grow by about 2 percent per annum, the same rate as in the unconstrained case but still one-third lower than the rate recorded between 1966 and 1978.

- Czechoslovakia would find growth slowing sharply as compared to the 1970s but not as a result of serious energy shortages. Other nonenergy factors—such as a nearly obsolescent capital stock—is expected to keep the growth of GNP at about 1.3 percent in both scenarios, or less than one-half the growth rate achieved in the 1966-78 period.

- Bulgaria's relatively small economy—combined with its capacity to expand domestic energy supplies—should allow it to meet most of its energy needs. The annual growth of GNP thus falls just marginally from the unconstrained case to about 1.1 percent. The marked slowdown in growth from the more than 4-percent annual average rate during 1966-78 is due largely to productivity problems.

- Hungary's energy supplies are expected to fall appreciably short of demand as a result of domestic production problems and the regime's external adjustment measures. GNP growth thus would decline to about 1.1 percent per annum, down from a 1.6 percent rate in the unconstrained case.

Table 3 *Percent per year*
Eastern Europe: Scenario 2: Projected Growth of Energy Supply and Demand, 1982-85

	Energy Supply	Energy Demand
Bulgaria	3.5	3.7
Czechoslovakia	1.7	1.8
East Germany	1.7	1.4
Hungary	0.8	2.0
Poland	0.1	1.2
Romania	1.2	2.9
Eastern Europe	1.3	1.9

Source: CIA estimates.

- Romania's energy-inefficient economy would grow by just 2 percent annually, compared to the nearly 3-percent rate feasible in the unconstrained scenario. In either case the GNP growth rate would be cut in half compared with performance during the 1966-78 period.

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- In Poland, since other problems overwhelm any prospective energy shortages, we project virtual stagnation over the next few years in both scenarios.

Scenario 3: Continued Cuts in Soviet Deliveries

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In Scenario 3 we assess the impact of a significant decline in the region's energy supplies as a result of further annual cuts in concessionary Soviet oil deliveries equal to 10 percent of 1981 levels, as were imposed on Czechoslovakia, Hungary, East Germany, and possibly Bulgaria in 1982. Such cutbacks would further crimp growth everywhere but in Romania, which traditionally has not received cutrate Soviet oil. Regional growth would fall considerably short of 1 percent, with some countries confronting stagnation or actual declines in GNP:

- Bulgaria, Czechoslovakia, and Hungary—traditionally large recipients of Soviet oil—would find growth dropping sharply in the face of another round of cuts in Soviet oil. GNP growth would virtually stagnate in Bulgaria and Hungary and drop to just 0.5 percentage point in Czechoslovakia.

- Further cuts in Soviet oil would also hit East Germany but not as hard as elsewhere in the region. GNP growth would slow to about 1.6 percent per annum.

- Poland is almost entirely dependent on the USSR for its oil supplies and could ill afford to be included in the next round of reductions. The loss of 10 percent of its Soviet oil imports would assure negative GNP growth. 25X1

Implications

Under the best of circumstances affecting energy supply, economic prospects in Eastern Europe would be dimmed by a host of other factors: 25X1

- The growth of the industrial labor force will be sluggish because of demographic trends.

- Labor productivity is unlikely to improve because of little investment growth, declining living standards, and continued systemic rigidities.

- Hard currency shortages will persist due to heavy debt service obligations, Western reluctance to extend credits, and the failure of many East European goods to meet the standards of Western markets. Existing rigidities in energy supply, of course, would become an increasingly effective brake on growth to the extent that regimes manage somehow to deal with these nonenergy constraints.

The possibility of further cuts in Soviet oil deliveries endangers achievement of even the poor growth rates now in prospect. Constant deliveries of Soviet energy in the near term could help Eastern Europe muddle along as it has the past few years. Further cuts in Soviet oil deliveries, however, would leave little hope for much if any economic growth and could have serious political repercussions throughout the region. This political factor must be weighing heavily on Moscow in considering the tradeoffs between maintaining deliveries to Eastern Europe and improving its own hard currency position.

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With prospects poor for any significant growth in domestic energy production over the medium term, Eastern Europe is left the option of restricting consumption. The regimes are likely to continue boosting domestic energy prices and reducing allocations to various customers as shortages arise. While we believe these conservation measures will help to alleviate spot shortages, they will not lead to a sustainable improvement in economic growth. 25X1

What is needed are far-reaching economic reforms to ensure more efficient use of energy and to improve domestic production possibilities. Such reforms might not have an appreciable impact in the short run, but in their absence, the long-term outlook for growth remains poor. Many of the East European regimes, however, still appear unwilling to make major changes in their economic systems as they struggle with implementing stabilization measures to cope with their financial problems. Moreover, decisions to launch fundamental shifts toward market-oriented policies almost certainly would have to await clear signals from Moscow. 25X1